CHAPTER 8: NATURAL RESOURCES

Introduction

The vitality of Flathead County is inextricably connected to the abundance of its natural resources. From the aboriginal tribes to the early settlers, prevalent natural resources have been utilized to sustain lives and livelihoods. In 21st century Flathead County, industries such as timber harvest, milling, mining, farming and ranching have shared a balance with real estate development, tourism and outdoor recreational activities. In the past as well as today, the County depends on the availability and utilization of natural resources.

The Montana State Constitution declares all citizens are entitled to clean air and water; this growth policy affirms this entitlement for residents of Flathead County. Air and water are two basic elements of a complex environmental system. The water cycle encompasses all the aspects of water quality, flooding and drought, while carbon and oxygen cycles affect air quality. There are many other nutrient cycles that directly or indirectly impact the quality – and in some cases quantity - of the county's natural resources. Development and human interaction can alter these cycles and create imbalance. Location of development is a key consideration when addressing environmental concerns. This growth policy seeks ways to protect the environment by adequately mitigating development impacts where practicable and restricting development in areas of high sensitivity.

Flathead County has an abundance of natural resources, with over 40 lakes and 3 major rivers surrounded by or adjacent to public lands. Flathead Lake extends from Flathead County into Lake County, encompassing nearly 200 square miles of surface area and 185 miles of shoreline. Flathead Lake is the largest natural freshwater lake between the Mississippi River and the Pacific Ocean, serving as a barometer of the ecological health for the entire Flathead watershed. The surrounding mountains are primarily forest lands managed by the federal and state government. Glacier National Park was established in 1910 and has become Flathead County's most popular tourist destination. The park is split between Flathead County and Glacier County and encompasses approximately 1,008,306 acres which include over 200 lakes and streams and over 700 miles of hiking trails[1].

Private timberlands generate positive contributions to Flathead County's economy through timber production as well as the maintenance of healthy forests, watershed protection, wildlife habitat and other aspects of public value. Flathead County's valley floor is open as a result of extensive logging in the late 19th and early 20th century, and therefore able to accommodate a variety of agricultural uses, extractive industries and residential and commercial development. The main tributaries that flow through the valley floor - the Flathead, Whitefish, Stillwater and Swan Rivers - have created areas of prime agricultural soils and critical riparian habitat.

[1] National Park Service, Glacier National Park webpage; http://www.nps.gov/glac/index.htm

Flathead County has a long history of beneficial utilization of its natural resources. Agriculture and timber production have historically provided a solid economic base for residents and a record of stewardship that has effectively preserved the abundant natural resources enjoyed today. These resource industries are based on the sustained production of essential products and effective management of the natural resources necessary for their creation. Their role in the protection of natural resources is recognized, as is the importance of their continued presence.

Flathead County Growth Policy public input meetings held between 2005 and 2006 generated an overwhelming response from participants about the preservation of natural resources. In particular, participants wanted goals and policies to protect water resources, open space, scenic views, air quality and wildlife habitat (see Appendix B: Public Involvement Summary). The majority of comments expressed concern about the degradation of natural resources from commercial and residential development, agricultural uses and extractive industries. The goals and policies that follow were developed from a public involvement process and are intended to promote and protect the public health, safety, and welfare of Flathead County directly dependent on natural resources.

Goal

G.35 Protect and preserve water resources within the Flathead watershed for the benefit of current residents and future generations.

Policies

P.35.1 Establish public/private partnerships to develop a Flathead basin watershed management plan using scientific data to determine critical areas and evaluate the impacts of future development on water quantity and quality.

P.35.2 Provide improved educational information to landowners on the importance of buffers and restoration techniques to reduce nutrient loading to water resources.

Goal

G.36 Protect water quality in lakes, rivers, aquifers and streams from existing and potential pollution sources.

Policies

P.36.1 Require development to demonstrate compliance with local, State, Tribal, and Federal water quality standards, where applicable.

P.36.2 Review and revise the Lakeshore Protection regulations to include consideration of potential harm caused by fertilizers and pesticides entering lakes, streams and rivers.

P.36.3 Investigate the feasibility of a regional wastewater treatment system. Ensure that the regional wastewater treatment plan protects the Flathead watershed.

P.36.4 Require all public waste water treatment systems to meet applicable DEQ discharge standards.

P.36.5 Identify and encourage land development practices that do not contribute to increases in Total Maximum Daily Loads.

P.36.6 Support non-point source pollution reduction within the Flathead Basin watershed.

P.36.7 Identify critical aquifer recharge areas in Flathead County and support land uses in these areas that protect water quantity and quality.

Goal

G.37 Prevent untreated storm water from entering into any surface water, stream, river, or lake.

Policies

P.37.1 Encourage the development of innovative stormwater collection, detention and retention systems.

P.37.2 Develop and provide educational information to individuals, organizations, and neighborhood associations regarding storm water management and the importance of proper storm water management practices.

P.37.3 Develop best management practices (BMPs) and setback requirements for development projects that impact water bodies. This may include vegetative buffer strips along stream sides and riverbanks, and the use of sedimentation barriers.

P.37.4 Encourage constructed wetlands as part of on-site drainage plans to restrict untreated storm water from entering lakes, rivers, and streams.

Goal

G.38 Preserve and protect floodplains to ensure the safety of residents from flood hazards and to prevent the degradation of water quality and critical wildlife habitat.

Policies

P.38.1 Adopt FEMA maps and existing floodplain studies as they become available.

P.38.2 Review and revise floodplain regulations as necessary. Consider appropriate setback requirements from floodplain.

P.38.3 Discourage development in floodway or floodway fringe that may result in a net increase in the floodplain area.

P.38.4 Consider density guidelines in the floodplain regulations.

P.38.5 Discourage development that displaces floodwaters within the 100-year floodplain.

Goal

G.39 Preserve and protect wetlands and riparian areas to prevent degradation of natural resources, including but not limited to water quality and critical wildlife habitat.

Policies

P.39.1 Use scientific studies to identify locations of riparian areas and delineated wetlands.

P.39.2 Encourage educational programs on voluntary conservation strategies for private property owners.

P.39.3 Develop regulations that restrict development in jurisdictional wetlands and riparian areas.

P.39.4 Develop best management practices (BMP's) and setback requirements for development to mitigate adverse impacts to sensitive wetland and riparian areas.

Goal

G.40 Protect sensitive areas over shallow aquifers.

Policies

P.40.1 Use scientific studies to identify the location of shallow aquifers.

P.40.2 Promote development in areas with public facilities or appropriate depth to groundwater to preserve water quality and water supply.

P.40.3 Encourage rural residential densities or community wastewater treatment systems in areas of high groundwater established by MT DEQ

P.40.4 Encourage rural low-intensity land uses in areas of high groundwater, as defined by the MT DEQ.

P.40.5 Develop incentives to encourage failing and polluting septic systems to be upgraded.

P.40.6 Encourage educational programs on septic system impacts to groundwater and surface water quality for neighborhood associations and other organizations to utilize.

Goal

G.41 Promote the preservation of critical fish and wildlife habitat and preserve the area's unique outdoor amenities and quality of life.

Policy

P.41.1 Develop an educational brochure that explains "Living with Wildlife" concepts and the impacts landowners can expect when living in rural areas of the County. Promote the document by distributing it to home buyers and home owners in Flathead County.

P.41.2 Discourage unmitigated development in areas identified as critical wildlife habitat.

P.41.3 Encourage maintaining and managing riparian areas in accordance with Montana state and federal laws.

Goal

G.42 Recognize and work to manage Flathead County's rich heritage of hunting, fishing, timber, agricultural and mineral activities that provide economic benefits while utilizing and protecting our natural resources.

Policy

P.42.1 Promote an active and environmentally responsible timber industry utilizing sustainable practices on private and public lands.

P.42.2 Encourage agricultural practices and uses which protect natural resources and allow for productive use.

P.42.3 Recognize and respect the important history and heritage of hunting and fishing by encouraging development that creates new or preserves existing access to public lands and waters.

For further policies associated with G.42, see G.3 and G.12 in Chapter 2.

Goal

G.43 Protect the air quality in Flathead County.

Policy

P.43.1 Implement the existing Flathead County Air Pollution Plan, adopted December 16, 1996 and revised January 17, 2008, into development standards. Any new plans should be considered for inclusion through a public process.

P.43.2 Prioritize and perform road-surfacing and dust abatement projects annually to reduce airborne dust generated from gravel-surfaced roads.

P.43.3 Encourage industrial and other land uses that do not degrade the Glacier National Park Class I air shed.

PART 1: Water Resources (see Goals 35 through 40)

Flathead Watershed

The Flathead Basin watershed encompasses approximately 8,587 square miles - or six million acres of land that drains water into Flathead Lake and the Flathead River. Running north to south the basin stretches 175 miles, and is 88 miles at its widest point. Water flows from headwaters in Glacier National Park, the Bob Marshall Wilderness and Canada into Flathead Lake.[2] Water from the Flathead Basin sustains life in the Flathead Valley and is delineated in Map 8.1.

[2] Flathead Basin Commission 2006-2011 Strategic Plan

The Flathead Basin encompasses the Swan, Stillwater and the Whitefish Rivers, as well as the North, Middle and South Forks of the Flathead River. The North, Middle and South Forks of the Flathead River drain the eastern portion of the Flathead Basin and merge at Columbia Falls to become the Upper Flathead River; combined, these forks of the Flathead contribute approximately 80% of the water entering Flathead Lake. The Whitefish River and Stillwater River drain the northwest part of the Flathead Basin and join the Upper Flathead River below Kalispell. The Upper Flathead River and Swan River are the two main tributaries that empty into the northeast corner of Flathead Lake. Water flow into and through the lake is controlled in part by the Hungry Horse Dam on the South Fork of the Flathead River, and the Kerr Dam near the lake's outlet south of Polson.[3]

Rivers and streams in the Flathead basin create floodplain areas, riparian corridors and wetlands critical to water quality, wildlife and fisheries habitat. Functional riparian corridors and wetlands are important because they filter nutrients, trap sediments, reduce flooding, stabilize soils and provide critical wildlife habitat. Riparian corridors typically extend along the banks of rivers, streams and drainage ways where ground water and surface water mix.

Groundwater is an important resource in the Flathead Basin. Most residential and agricultural development relies on groundwater wells for drinking water. Shallow aquifers provide water to many of the wells. Well-defined shallow aquifers include the Delta region, located between the north shore of Flathead Lake and the Flathead River; the Evergreen aquifer located between the Flathead and Whitefish Rivers, which is the most developed shallow aquifer; the east side between the Flathead River and the foothills of the Swan Mountains; and the Lost Creek fan west of the Stillwater River near the Salish Mountains. Most other places where shallow aquifers have been developed are along stream valleys.

Major threats to the water resources of the Flathead Basin include non point source pollution, where sediments and nutrients - in particular nitrogen, or nitrates, and phosphorus - end up in streams and lakes via storm water runoff or groundwater contamination. Water quality in Flathead Lake is an important indicator of the health of the entire Flathead Basin. Research by the University of Montana Flathead Lake Biological Station at Yellow Bay shows that water quality in Flathead Lake has been declining since the 1970s. Flathead Lake has been listed as an impaired water body by the Montana Department of Environmental Quality since 1996, and water quality monitoring of the lake and its tributaries continues to be vital for evaluating and understanding long term trends.[4]

Clean Waters

Preservation and improvement of water quality are perhaps the most critical elements when considering surface waters in Flathead County. The high water quality of Flathead

[3] *Flathead Watershed Sourcebook: A Guide to an Extraordinary Place*. Chapter 1, pp. 3
[4] Flathead Lakers Water Quality Monitoring; http://www.flatheadlakers.org/index.php?page=water-quality

County's lakes and rivers is consistently referred to as a prized and cherished characteristic of the Flathead Basin that leads to a high quality of living for residents and visitors.

The North and Middle Forks of the Flathead, as well as the South Fork of the Flathead River above the Hungry Horse Reservoir, are designated as Wild and Scenic Rivers. Under the authority of the Wild and Scenic Rivers Act of 1968, a river or river section may be designated by the U.S. Congress or the Secretary of the Interior. Rivers, or sections of rivers so designated are preserved in their free flowing condition and are not dammed or otherwise improved. These portions of the Flathead River include the landscapes of Glacier National Park and the Bob Marshall and Great Bear Wilderness areas.

Designation as a Wild and Scenic River is not the same as designation as a national park, and generally does not limit use of a river in the same manner as a Wilderness Area designation. The idea is not to halt development and/or use of a river, but to preserve the character of a river.

Every two years the Montana Department of Environmental Quality (DEQ) compiles a list of water bodies that fail to meet water quality standards. This document is known as the 303(d) list, after the section of the Federal Clean Water Act that requires states to report impaired waters. The 303(d) list identifies the probable causes of impairment as well as the suspected sources of the pollutant. In turn, the DEQ is required to develop Total Maximum Daily Loads (TMDL) for all water bodies on the 303(d) list. (See Appendix A)

There are two primary sources of water pollution resulting from human influence – point source and non-point source pollution. Point sources are discharges from a specific outlet such as pipes or ditches, and are regulated through permits issued by the DEQ. Examples of point sources include municipal and public sewage treatment facilities, factories, some storm sewers and large livestock feedlots. Non-point sources are more dispersed and generally relate to land extensive activities from multiple contributors that do not require discharge permits. Non-point sources include agriculture and forestry activities, small construction projects, unregulated storm water discharges, individual septic systems and the many negative effects resulting from forest fires. Another potential source of non-point source pollution is leakage from municipal sewer lines. There are also natural sources of pollution that are inherent to any watershed and are contributed without the influence of human activity. Examples include sediment and nutrient loading as a result of fire, or the naturally high concentration of metals or chemicals in rocks and soil which leach into surface or groundwater.[5]

A Total Maximum Daily Loads (TMDL) is the total amount of a pollutant a given water body can receive without exceeding water quality standards. The purpose of establishing TMDLs for waterbodies throughout this state is to ensure there are safe and healthy

[5] Understanding the Montana TMDL Process (pamphlet); by the Montana Department of Environmental Quality, 2007.

waters available for current and future generations of Montanans. The TMDL process for a particular watershed and/or water body begins by diagnosing the problems concerning water quality; identifying and assessing the source(s) of the problem; setting pollutant level thresholds (or targets); setting a TMDL based on the established threshold; allocating the amount of pollutant reduction among all the contributors; and outlining how those reductions can be made. Once this process is complete, decisions about what to do next rest in the hands of local governments, individuals and organizations. The TMDL process by itself does not institute new regulations; however, local governments may decide regulatory measures are appropriate to ensure the recommended reductions are made and water quality standards are met.[6]

Flathead Lake has been listed as a "water quality limited water body" or "impaired" by the Montana Department of Environmental Quality; therefore, Total Maximum Daily Loads (TMDL) have been determined for the lake to guide restoration efforts reducing point and non-point source based pollution. TMDL's have also been established for the Swan River Watershed and the Flathead Headwaters (including the North, Middles and South Forks of the Flathead River). Current TMDL efforts in Flathead County include developing TMDLs for impaired waters in the Flathead-Stillwater Planning area, as well as the development of Phase II TMDL allocations for the Flathead Lake Watershed. Phase I TMDL allocations for Flathead Lake are shown in Table 8.1 below; Table 8.2 identifies streams and lakes throughout the Flathead watershed that are impaired for nutrients, sediment and temperature. [7]

Table 8.1
Proposed Flathead Lake TMDL Targets

Primary production	80.0 g C/m^2/yr
Chlorophyll a	1.0 micrograms/liter
Soluble Reactive Phosphorous (SRP)	<0.5 micrograms/liter (BDL)
Total Phosphorous	5.0 micrograms/liter
Total Nitrogen	95 micrograms/liter
Ammonia (NH_3)	<1.0 micrograms/liter
Nitrate/ Nitrite ($NO_{2/3}$)nitrogen	30 micrograms/liter
No measurable blooms of Anabaena (or other pollution algae)	
No oxygen depletion in the hypolimnion	
Algal biomass measured as Chlorophyll a (on near-shore rocks) remains stable or exhibits a declining trend.	

Source: *Appendix C: Current Flathead Lake Monitoring Program (2000),* Flathead Lake Biological Station. http://deq.mt.gov/wqinfo/TMDL/finalReports.mcpx

[6] Understanding the Montana TMDL Process (pamphlet); by the Montana Department of Environmental Quality, 2007.
[7] Flathead TMDL Project – Montana DEQ and U.S. Environmental Protection Agency (EPA); http://montanatmdlflathead.pbworks.com/w/page/21641099/Welcome%20to%20the%20Flathead%20Basin

Table 8.2
Flathead Basin Impaired Streams and Lakes

	Impaired Streams & Lakes		
TMDL Planning Area	**Nutrients**	**Sediments**	**Temperature**
Flathead Lake	Flathead Lake	Flathead Lake	(none)
Flathead Headwaters	Challenge Creek	(none)	(none)
Flathead - Stillwater	Lake Mary Ronan, Ashley Creek, Fish Creek, Sheppard Creek, Spring Creek, Stillwater River, Swift Creek, Whitefish River	Whitefish Lake, Ashley Creek, Fish Creek, Logan Creek, Sheppard Creek, Stillwater River	Ashley Creek, Whitefish River

Source Flathead TMDL Project – Montana DEQ and U.S. Environmental Protection Agency (EPA);
http://montanatmdlflathead.pbworks.com/w/page/21641099/Welcome%20to%20the%20Flathead%20Basin

According to Section 303(d) of the Federal Clean Water Act, and Title 40 part 130 of the Code of Federal Regulations, each state is required to develop a list of waters that do not meet water quality standards. The 303(d) list is a subset of all impaired waters listed in the comprehensive 305(b) water quality report. Water bodies on the 303(d) list have at least one impairment caused by a pollutant, and are currently without a TMDL completed and approved by the Environmental Protection Agency (EPA). A water body is placed on the 303(d) list when it does not meet, or is not expected to meet the state's water quality standards after full implementation of technology-based controls – because of this it is considered 'impaired'. Up-to-date annual lists of 303(d) impaired water bodies in Flathead County can be found by visiting the Clean Water Information Center on the Montana Department of Environmental Quality's website.[8]

The 303(d) List identifies probable causes of impairment such as, nutrients, siltation, suspended solids, flow alteration, organic enrichment or low dissolved oxygen, algal growth, PCBs, metals, mercury, and noxious aquatic plants. The main sources of pollution include runoff from development, old and poorly maintained septic systems, poor agricultural and timber harvest practices, and air pollution. Air pollution contributors include dust, exhaust and fumes as well as smoke from chimneys and forest fires.

In 1998, the levels of dissolved oxygen in the Big Arm Bay of Flathead Lake were the lowest ever recorded and blooms of a pollution algae (Anabaena Flosaquae) were observed near shore. The result is the oxygen supply in the water becomes depleted. Similar oxygen sags, as they are called, have been identified in Swan Lake and Whitefish Lake. Nitrogen concentrations in the Stillwater and Flathead rivers were among the highest ever recorded. As nutrients increase (nitrogen and phosphorus), the number of algae and other organisms increase. As these organisms die, bacteria break down their remains using oxygen in the process. Oxygen depletion is a recognized sign of water quality degradation.

[8] Clean Water Act Information Center, Montana Department of Environmental Quality: http://cwaic.mt.gov/faq.aspx?qryId=87109

Wastewater is produced from homes, industries, schools, and businesses; thus demand on wastewater systems is dependent on land use, population density, the magnitude and type of commercial and industrial activity in the area, visiting population and employment impact, the condition of the existing systems and regulatory requirements. Wastewater treatment plants remove solids, organic matter, nutrients, and pollutants and restore oxygen before discharging into surface water bodies.

The *Nutrient Management Plan and Total Maximum Daily Load for Flathead Lake, Montana*[9] provides a prioritized nutrient management plan for the Flathead Lake. This document presents information on point and non-point sources of pollution to the Flathead Lake watershed and makes recommendations on approaches to achieving water quality goals for this same body of water. The document offers sources of pollution to the entire watershed and shows Sewer Treatment Plants (STPs) at 2% and 1% of the total Phosphorus and Nitrate/Nitrite load respectively (Figures 4 – 7 and 4 – 8). Nonetheless, the State of Montana Department of Environmental Quality mandates phosphorous limits for wastewater treatment plants. The City of Kalispell's Advanced Waste Water Treatment Plant continues to surpass its 1 mg/L total Phosphorus permit requirement by meeting levels closer to a daily average of 0.2 mg/L for total phosphorous and voluntarily undertakes active nitrogen removal.

In order to meet the needs of a growing community and to continue the City of Kalispell's efforts to protect streams and groundwater in the area, it was necessary to increase the City's wastewater treatment capacity in 2006. In preparation for growth and to provide adequate infrastructure for the next 20 years, the City upgraded the Advance Wastewater Treatment Plant to the design capacity of 5.4 million gallons per day.[10]

Past efforts to reduce the amount of nutrients reaching Flathead Lake and its tributaries have been successful. Upgrading sewage treatment plants in the upper basin for phosphorus removal, connecting Evergreen to the Kalispell sewer system, and banning domestic use of phosphorus containing detergents have reduced the amount of nutrients reaching Flathead Lake from these sources. Community facilities have also played a significant role in reducing non-point loading. Reductions in non-point loading through the development of new public systems, such as Lakeside/Somers, and the expansion of areas served by public systems such as Evergreen, Big Mountain, Whitefish Lake and Bigfork have played a major role in protecting water quality.

Storm Water Runoff

Polluted runoff, also known as non-point source pollution, is perhaps the greatest threat to water quality in the Flathead Basin. It is caused by rainfall or snowmelt moving over and through the ground. As it moves, runoff picks up and carries natural and human-caused pollutants, finally depositing them into rivers, lakes and groundwater.

[9] Executive Summary: *Nutrient Management Plan and TMDL for Flathead Lake, Montana.* 12/28/2001. Montana Department of Environmental Quality.
[10] *City of Kalispell Wastewater Facility Plan Update*, March 2008. Prepared by HDR Engineering, Inc.

Croplands, livestock feedlots, golf courses, lawns, gardens, roadways, parking lots, construction sites, landfills, city storm sewers, logging operations, residential septic systems and erosion from streams, river banks and lake shores are all sources of polluted runoff. Even airborne chemicals and particulates resulting from wood-burning chimneys and forest fires can be carried into our waters by rain or snow and contribute to the non-point source pollution problem.

The scattered locations of these pollutants and their often unpredictable dispersal make clean up efforts complex and often costly. This is because the waterways within a watershed are interconnected. Streams flow into rivers, which in turn flow into lakes. Surface waters and groundwater are often interconnected; a pollutant introduced in one area upstream can pollute the water downstream.

Meeting TMDL targets and allocations for Flathead Lake will require reductions in nutrient loading in the Flathead River Headwaters and Whitefish and Swan Lakes as well as rivers and streams that flow into and out of these lakes. Increased development in close proximity to rivers, lakes and streams directly contributes to non-point source pollution. Impervious surfaces increase the amount and velocity of stormwater run-off, carrying pollutants directly into waterbodies with limited opportunity for infiltration. Limiting development in these areas or increasing the amount of pervious surface (i.e. natural grass, foliage or other types vegetation) between impervious surfaces and water bodies helps reduce the velocity of run-off as well as the amount of non-point pollutants entering our lakes and streams.[11]

Floodplains

Flooding causes more property damage in the United States than any other natural disaster. It is estimated that flooding causes 90 percent of all property losses from natural disasters in the United States. In terms of economic disruption, property damage and loss of life, floods are "nature's number one disaster."[12]

The presence of floodplain in Flathead County [see Map 2.6 and 2.6(a)] is an impediment to growth and development. The topography of the county, which includes extremely mountainous areas, large lakes, several deep river valleys and the low valley floor, form a very complex drainage system and wide variation in climate.

Foothills and valley bottom land make up approximately 20 percent of the county landscape. The relatively flat terrain of the valley floor manifests itself in the sinuous nature of the rivers that wind through the valley to Flathead Lake. Glacier outwash underlies most of the area in the Flathead River Valley and forms floodplains and terraces adjacent to the Flathead River and its tributaries.

[11] Coffman, Larry S. *Low-impact development: An alternative to stormwater management technology.* Handbook of Water Sensitive Planning and Design. Lewis Publishers, 2002. pp. 97-123.
[12] National Flood Insurance Program. *Flood Insurance Guide for Community Associations*. 2005.

Precipitation averages are generally higher in Flathead County than in other areas of Montana. The most severe flooding in Flathead County usually occurs in the spring and early summer months as a result of snowmelt and/or rainfall runoff. On rare occasions, ice jams result in some overbank flooding. In addition to flooding along streams, shallow flooding periodically occurs in other isolated, developed areas of the county due to other factors. The mountains can receive several hundred inches of snow annually. Low flows in the basin occur naturally during the winter months, and floods normally occur in the spring during periods of rapid snowmelt. Runoff from snowmelt, occasionally combined with rainfall, provides high streamflows in the spring.

Historically, flooding has shaped much of the Flathead Valley floor. The Flathead Valley has experienced six (6) severe flood events. These occurred in 1894, 1926, 1948, 1964, 1975 and 1995. During the 1964 flood, families were evacuated from their homes, livestock drowned, and property damage was excessive. For a history of these floods, see Appendix A: Baseline Analysis.

The 100-year floodplain, also known as the Special Flood Hazard Area (SFHA), is the land subject to inundation by one percent (1%) or greater chance of flood in any given year. Construction is extremely limited in these areas and requires state, federal and local permits. The SFHA is divided into two parts: the floodway and the floodway fringe. The floodway is the channel of a stream and any adjacent floodplain areas that must be kept free of encroachment so that a 1% annual chance flood can be carried without substantial increases in flood heights.[13] The floodway further limits the amount of construction within its boundary, beyond that which is allowed by permit within the SFHA in general. According to the Flathead County Floodplain Regulations, the floodway fringe is defined as the portion of floodplain *outside* the limits of the floodway.

The Federal Emergency Management Agency (FEMA) has not identified all of the floodplain in Flathead County, but most of the Flathead, Whitefish and Stillwater River corridors and the valley bottoms have been mapped and shown on the Flood Insurance Rate Maps (FIRM). Approximately 12% of the valley area of Flathead County is designated as 100-year floodplain. An additional 2 to 3% of the valley bottom is designated as 500-year floodplain.[14] Most of the floodplain is located along the Flathead River corridor between Columbia Falls and Flathead Lake. Areas of 100-year floodplain are present along the Stillwater and Whitefish Rivers.

Flathead County also contains areas where FIRM panels are not printed. These areas are considered to be unmapped, or areas where no SFHA is present. Although many of these areas contain streams and rivers that have flooded in the past, since they are not located on a FIRM panel they are not required to comply with the Flathead County Floodplain and Floodway Management Regulations.

[13] FEMA Map Service Center, Definitions of FEMA Flood Zone Designations. http://www.fema.gov/

[14] Calculations based on current Flathead County GIS data provided by FEMA; calculations contemplate the amount of 500-year floodplain *beyond* what is already classified as 100-year floodplain.

FIRM panels can only be amended or modified by FEMA. There are two ways for individual property owners to amend an adopted FIRM panel. If a property owner feels that they have inadvertently been included in the floodplain and that the ground is *naturally* above the 100-year floodplain elevation, they can apply to FEMA for a Letter of Map Amendment (LOMA). If a property owner has placed fill or other material to raise the ground *artificially* above the 100-year floodplain elevation (with an appropriate permit), they may apply to FEMA for a Letter of Map Revision based on Fill (LOMR-F). If FEMA approves the LOMA or LOMR-F, a Letter of Determination is sent to the applicant indicating the new flood zone designation. A copy of the determination is also submitted to the Community; however the actual FIRM panel is not reprinted.

100-year floodplain offers numerous benefits to the property and community by:

- Providing flood storage and conveyance;
- Reducing flood velocities and the potential for erosion;
- Absorbing large volumes of water and gradually releasing it to adjacent streams or water bodies during low flow periods;
- Recharging wells and aquifers by holding water long enough to allow it to percolate into underlying soils;
- Supporting vegetation that acts as a flood buffer and stabilizes the shoreline;
- Enhancing water quality by absorbing sediments, toxins and nutrients;
- Providing habitat for millions of birds, mammals, reptiles, fish and amphibians.

Construction is allowed in the floodway fringe by special permit and must meet established regulations. The Flathead City-County Health Department, which issues permits for all on-site sewage disposal systems, does not allow a system in or within 100 feet of a designated 100-year floodplain because of DEQ requirements that septic systems be 100 feet from surface water.

Current national floodplain management standards allow for channel and overbank conveyance areas to be reduced, essential valley storage to be filled, or velocities changed with little or no regard to how these changes impact others in the floodplain and watershed. The net result is that through our actions we are intensifying damage potential in the floodplain. This current course is not equitable to those whose property is impacted, and has been shown to be economically unsustainable.

The Association of State Floodplain Managers and the Association of Montana Floodplain Managers support local accountability and active management of the floodplain through outreach and education. Both organizations support the "No Adverse Impact" policy that is meant to ameliorate negative impacts associated with floodplain development. This growth policy discourages activities in the floodplain that might displace floodwaters to neighboring properties.

Riparian Areas and Wetlands

The NRCS defines riparian areas as ecosystems that occur along watercourses or water bodies. They are different from surrounding lands because of unique soil and plant

characteristics that are strongly influenced by free or unbound water in the soil. Riparian ecosystems occupy the transitional area between the terrestrial (dry) and aquatic (wet) ecosystems. Typical examples would include floodplains, streambanks, lakeshores, and wetlands. Riparian areas may exist within any land use area, such as cropland, hayland, pastureland, rangeland, and forestland.[15]

Wetlands are areas where water covers the soil, or is present either at or near the surface of the soil all year or for varying time periods throughout the year. Water saturation levels (hydrology) determine how the soil develops and what types of plant and animal communities can be supported in the environment; wetlands can support both aquatic and terrestrial species. Inland wetlands (such as those found in Montana) are commonly found on floodplains along rivers and streams (riparian wetlands); in isolated depressions surrounded by dry land; along the margins of lakes and ponds; and in other low lying areas such as vernal pools and bogs. Inland wetlands include marshes and wet meadows as well as wooded and shrubby swamps.[16]

Wetland preservation is beneficial to many species of plants, birds, mammals and invertebrates. They serve as retention areas for overflowing rivers, lakes, and streams, thus reducing flood and erosion damage in other areas. Wetlands also filter pollutants through plant assimilation and slowing untreated surface runoff before entering the water body.

Only about 4% of the land area in the state of Montana has been identified as riparian and/or wetland habitat. Yet these areas are critical to conservation efforts, as many of the the state's mammals, birds, amphibians, reptiles and fish depend on these riparian habitats for survival. According to the Comprehensive Fish and Wildlife Conservation Strategy prepared by Montana Fish, Wildlife & Parks, 196 of the 265 terrestrial species found within the wetland and riparian community type are classified as being "essentially associated", which means an association exists between geographic area, type of vegetation, or fish and wildlife species that is critical to the existence of a population of fish or wildlife. Additionally, 17 of the 19 species of greatest conservation need found in these riparian and wetland community types are essentially associated.[17]

The quality of Montana's blue ribbon streams are uniquely dependent on the riparian habitat that is commonly found along rivers, streams and lakes. These areas usually have a variety of riparian forbs, shrubs and trees such as cottonwood, alder, serviceberry, chokecherry and willow to keep them intact. There is abundant wildlife and waterfowl as well as amphibious and unique plant life.

Riparian areas help slow stream bank erosion, remove contaminants from water draining into streams and rivers, improve fish habitat and help to maintain cool water temperatures that many fish species require to survive. Riparian habitat may be degraded when water diversions and dams prevent flooding or when wetlands are drained or filled. Harvesting

[15] Natural Resources Conservation Service (NRCS); http://www.mt.nrcs.usda.gov/technical/ecs/water/setbacks/
[16] USEPA Circular on Wetlands: http://water.epa.gov/type/wetlands/
[17] Comprehensive Fish & Wildlife Conservation Strategy; Montana Fish, Wildlife & Parks, 2005

of trees, noxious weed invasions, livestock over-grazing and human use can destroy stream riparian habitat. Maintaining proper and healthy vegetation may include harvesting and planting trees along with trimming and planting shrubs.

The main stem of the Flathead River, Stillwater River, Whitefish River and Ashley Creek, as well as their associated backwater channels, spring creeks, wetlands and tributaries provide important wildlife habitat. Areas that support intact natural stands of forest and shrubby vegetation are critical to a variety of species. These areas provide food as well as screening and thermal cover, and although these habitats may be intermingled with residential development and agricultural use, they remain important to the wildlife species that depend on them.

Groundwater and Depth to Water Table

Groundwater is water that fills pores and cracks in rocks and soil. Groundwater sustains lake levels, provides for base flows in streams, and is a major source of domestic water. Groundwater comes from precipitation and condensation that enters the soil and is susceptible to depletion in quantity and degradation of quality. Groundwater flows beneath the surface of the earth, generally moving downhill following the contours of the land toward a point of discharge, usually a lake, stream, spring or well. [18]

The depth to groundwater varies with seasons and precipitation levels. Many areas experience seasonally high groundwater levels, typically in the spring, which limits land use. These areas are commonly located within or near floodplain, alluvial deposits and swamps, and their presence places certain limitations on septic tanks, basements and road building. In Flathead County, both public and private water supplies commonly depend on wells that utilize a variety of natural aquifers.

An aquifer is a water-bearing layer of permeable rock, sand or gravel. The thickness and depth of an aquifer vary with its location. The quantity of water a rock can contain depends on its porosity or the amount of open space and cracks between grains. Water movement in rock depends on permeability, defined as the measure of how well spaces are connected and allows water to flow. Aquifers are recharged or filled by precipitation and infiltration from streams. Recharge is greatest in late spring when snow melt creates runoff from the mountains.[19]

According to a 2004 report by the Montana Bureau of Mines and Geology[20], a large intermediate and deep aquifer sits below Flathead Valley, in the "Kalispell Sub-Area". This large aquifer is confined by bedrock to the north, west and east, and by Flathead Lake to the south. Water at depths of 100-200 feet below the surface is considered to be from the intermediate aquifer, while wells drilled to over 200 feet below the surface are

[18] U.S. Geological Survey Open File Report 93-643; http://pubs.usgs.gov/of/1993/ofr93-643/
[19] U.S. Geological Survey Open File Report 93-643; http://pubs.usgs.gov/of/1993/ofr93-643/
[20] LaFave, John, Smith, Larry N. and Patton, Thomas W. *Ground-Water Resources of the Flathead Lake Area: Flathead, Lake, Missoula, and Sanders Counties, Montana. Part A- Descriptive Overview and Water Quality Data.* Montana Bureau of Mines and Geology. 2004.

considered to be utilizing the deep aquifer. Well logs show that most residents living at the outer perimeter of the Flathead Valley derive water from the intermediate and deep aquifer.

Recharge to the intermediate and deep aquifer comes from the mountain ranges surrounding the valley. Recharge occurs within and at the base of the Swan range front to the east, along the base of the Whitefish range to the north, and along the Whitefish and Salish ranges to the northwest and west. Much of the recharge is often at the valley floor where the aquifer contacts are relatively close to the surface and the overlying impermeable deposits are thin or absent. Sources of recharge come mainly from precipitation and snow melt run-off. Run-off from the Swan range front seems to contribute a significant amount through surface water to recharge the deep aquifer as well as overlaying shallow perched aquifers along the valley margins. Noisy Creek, Krause Creek, Brown Creek, Blaine Creek, Hemler Creek and others all go immediately underground at, or shortly after, contact with the valley floor. Brown Creek alone has been shown to produce peak flow rates in excess of 20 cfs and produce an average volume of nearly 3,000 acre-feet, none of which reaches far beyond Foothill Road before it disappears into the gravels of the deep aquifer. Interformational leakage from the shallow perched aquifers may also recharge the deep aquifer at differing locations in the valley. Clearly, the quality and quantity of the deep aquifer owes a significant amount of its water recharge to the west side of the Swan range, and protection of the quality and quantity of water that comes off of this basin is one of the keys to the long term health of the deep aquifer.[21]

The median yield reported from wells accessing the intermediate and deep aquifer is 25 gallons per minute. The Bureau of Mines and Geology report states that a downward trend in intermediate and deep aquifer irrigation well water levels was observed in the 1980s, but the trend appeared to level off in 1991. Overall water level declines over the past 10-20 years have been observed in most long-term records of all wells accessing intermediate and deep aquifers. The Bureau of Mines and Geology calls for continued monitoring of deep aquifer water levels to allow time for remedial steps by users if water levels should become dangerously low.

Residents living closer to the center of the valley commonly access a shallow alluvial aquifer, often referred to as the Evergreen Aquifer. The Evergreen Aquifer is located between the Flathead River to the east and Whitefish River to the west, and between Badrock Canyon to the north and the confluence of the Flathead and Whitefish rivers to the south. The depth to water table in this area is generally less than 50 feet and, for much of the area, less than five feet.

A significant amount of area with seasonally high ground water and/or frequent flooding can be found throughout the Flathead River corridor and the valley bottom, which is experiencing development pressure. Much of the development south of Kalispell in the

[21] LaFave, John, Smith, Larry N. and Patton, Thomas W. *Ground-Water Resources of the Flathead Lake Area: Flathead, Lake, Missoula, and Sanders Counties, Montana. Part A- Descriptive Overview and Water Quality Data.* Montana Bureau of Mines and Geology. 2004.

Lower Valley area is occurring where the depth to groundwater is less than 15 feet. Homes being constructed in this area are on individual water and septic systems. Since there is a direct connection between the aquifer and the Flathead River and Flathead Lake, activity that substantially or incrementally changes the natural integrity of the floodplains and their aquifers will have a direct and pervasive impact on surface water quality. The groundwater supply in this area feeds directly into the aquifer and Flathead Lake. High density development in Lower Valley and other areas of high groundwater has the potential to degrade the water quality of both Flathead River and Flathead Lake, as well as the groundwater that supplies and recharges domestic water wells in the area.

The Flathead Lake Biological Station of the University of Montana has conducted groundbreaking research (see Appendix A: Baseline Analysis) detailing the environmental importance of the shallow alluvial aquifer of the Flathead River. They have documented water flows and detailed the effects of pollution through continued water quality monitoring of Flathead Lake and its tributaries. They have also identified areas where the depth to groundwater is five feet or less as critically sensitive.

Shallow aquifers are intrinsically susceptible to surface sources of contamination. The aquifer materials are highly permeable, allowing rapid movement of water (and any associated contamination) from the land surface to the aquifer. Furthermore, as the land surface in the valley becomes more developed, potential sources of point and non-point source contamination will increase. Surface land uses not compatible with water quality policies in areas of shallow groundwater should be discouraged. High density individual wastewater disposal systems, high density housing, open pit gravel and mineral operations and other industrial uses are examples of surface land uses that have the potential to create health and safety issues in areas of shallow groundwater.

PART 2: Fish and Wildlife Resources (see Goals 36 through 38 and 41)

Fish and Wildlife Species

Mountain forests, meadows, streams, lakes, valley rivers, wetlands and riparian corridors provide aquatic and terrestrial habitats for wildlife. These areas are nesting sites for 319 species of birds including the threatened bald eagle. Only one mammal present in the Flathead Watershed - the Canada lynx – is currently listed as a threatened species according to the U.S. Fish and Wildlife Service. The grizzly bear is unique in that it is managed by the federal government in geographically distinct locations which include the Yellowstone, North Continental Divide, Selkirk, Cabinet-Yaak, North Cascades and Bitterroot ecosystems. In March of 2007 the U.S. Fish and Wildlife Service announced the Yellowstone District Population Segment (DPS) of grizzly bears no longer met the ESA's definition of 'threatened' or 'endangered', and was subsequently delisted. While this decision and its impacts continue to be debated in the court system, the grizzly remains a threatened/endangered species in the remaining ecosystems, including the Northern Continental Divide and Cabinet-Yaak regions within and surrounding Flathead

County.[22] The gray wolf was recently removed from the endangered species list following three decades and much controversy. Forty-six (46) species of fish inhabit the aquatic ecosystems, which also provides habitat for seven species of amphibians and nine species of reptiles.[23]

The biggest threat to fish and wildlife is habitat loss. The Montana Fish, Wildlife, and Parks (FWP) is the primary agency responsible for management of fish and wildlife populations in the Flathead. FWP jointly manage fish and wildlife habitats with the Salish and Kootenai Tribes within the Flathead Reservation. Throughout the year, FWP regulates fishing and hunting seasons for big game, upland game birds, webless migratory birds, waterfowl and furbearers. The white-tailed deer remains the most popular big game animal pursued by hunters in northwest Montana, known as FWP Region 1.[24]

Fish Species

The rivers, streams, reservoirs and lakes of Flathead County support native fish communities that are threatened from declining water quality and the introduction of non-native fish species. Of the 46 species of fish that call the Flathead Watershed home, only 23 are considered native; these include the westslope cutthroat trout, bull trout, lake trout lake whitefish, mountain whitefish, pygmy whitefish and grayling. Long considered the lifeblood of the watershed for their persistence over 14,000 years, the bull and westslope cutthroat trout are indicator species for environmental disturbance in the watershed. The westslope cutthroat has experience significant declines in numbers over the years, as a result of habitat degradation, competition with non-native species, hybridization and a high intolerance for disturbance; the fish now occupies between 19-27% of its historic range in Montana. Bull trout have been listed as threatened species according to the U.S. Fish and Wildlife Service.[25] In the past Montana Fish, Wildlife, and Parks (FWP) fisheries biologists have conducted sinking and floating gill net surveys of Flathead Lake to assess shifts in species composition. Gill net surveys occurring in 1983 (pre-mysis) and 1999, showed a decrease in native westslope cutthroat trout from 23% of the catch in 1983 to only 5% of the catch in 1999. Conversely, the survey showed the presence of the northern pike minnow increased from 12% of the catch in 1983 to 25% of the catch in 1999.[26] A similar gillnet survey was proposed by Montana FWP as part of the ongoing co-management plan for Flathead Lake in 2010; however, the results of the survey are not yet available for comparison.

[22] U.S. Fish & Wildlife Service, Mountain-Priarie Region Endangered Species Program. Grizzly Bear Recovery. http://www.fws.gov/mountain-prairie/species/mammals/grizzly/
[23] Flathead Watershed Sourcebook, Chapter 2 – Natural History, 2010 Edition; pp.59 through 73.
[24] http://fwp.mt.gov/regions/r1/
[25] Flathead Watershed Sourcebook, Chapter 2 – Natural History, 2010 Edition; pp.59.
[26] Montana FWP; Confederated Salish and Kootenai Tribes. *Flathead Lake and River Fisheries Co-Management Plan, 2001-2010*. November 2000; pp. 30.

Wildlife Species

Of the total 3,262,720 acres that make up Flathead County, 78.6% of the land is managed by federal, state or tribal agencies (see Chapter 2: Land Uses). These public lands are home to a wide range of forest carnivores, big game species, osprey, eagles, upland game birds, migratory waterfowl, amphibians and reptiles.

Important wildlife species include grizzly and black bear, mountain lion, white-tailed deer, three species of mountain grouse, and furbearers such as the marten and wolverine. Big game species include black bears, mountain goats and lions, moose, elk, white-tail and mule deer. Elk and deer inhabit forested areas, while moose typically occupy wetland and riparian areas. Highly important bear habitats occur along foothills of major valleys, particularly the east Flathead Valley, Stillwater, Swan, Middle Fork, and North Fork Valleys.

The U.S. Fish and Wildlife Service maintains a list of all species classified as endangered, threatened or candidate in Flathead County. Endangered species are in danger of extinction throughout all or a significant portion of their range. Threatened species are likely to become endangered within the near future. Candidate species are those for which there is sufficient information on biological vulnerability and threats to support a proposal to list as endangered or threatened. The loss of a species to extinction can have irrevocable impacts on the ability of remaining species to survive.

Table 8.3
Endangered, Threatened, and Candidate Species

Designation	Species Name
Endangered	None
Threatened	Canada lynx, bull trout, Spalding's Catchfly
Candidate	None

Source: Montana Natural Heritage Program Plant/Animal Species of Concern Report(s) for Flathead County; October 2011

Glacier National Park and the Flathead National Forest include Federal Wilderness, Research Natural Areas and Wild and Scenic Rivers. These critical habitat areas provide large, relatively undisturbed blocks of open space important for wildlife migration corridors. A variety of designated protection areas exist in Flathead County. Table 8.4 shows over 15,000 acres that have been permanently set aside for the health of fish and wildlife species.

Table 8.4
Special Designated Wildlife Areas in Flathead County

Name	Acres	Year Initiated	Management Agency
Flathead Waterfowl Protection Area	2,370	1971	FWS
Batavia Waterfowl Protection Area	510	1975	FWS
Smith Lake Waterfowl Protection Area	975	1973	FWS
Blasdel Waterfowl Protection Area	535	1987	FWS

McGregor Meadows Waterfowl Protection Area	799	1999	FWS
Lost Trail National Wildlife Refuge	7,885	1999	FWS
Ray Kuhns Wildlife Management Area	1,530	1953-1986	FWP
Flathead River Wildlife Habitat Protection Area	216	1986-1999	FWP
Owen Sowerwine Natural Area	442	1970s	DNRC
Total	**15,262**		

Source: U.S. Fish and Wildlife Service, MT DNRC, MT Fish, Wildlife & Parks websites

PART 3: Land Resources (see Goals 36 through 42 and see also Chapter 2: Land Uses)

Forestry

Proactive forest management creates healthy forest ecosystems through practices that include planting, thinning and harvesting of forest vegetation. Proper management of forests protects the cultural integrity of Flathead County and promotes the health and safety of residents by reducing the risk of wildfires and contributing to the local economy.

The USDA Forest Service is responsible for management of National Forests (including wilderness areas), and Flathead County contains portions of four National Forests and two Wilderness Areas. Flathead National Forest (including portions of the Great Bear and Bob Marshall Wilderness Areas) has approximately 1,875,545[27] acres within Flathead County. Various species of trees found in the mid elevation areas of these forests are Douglas fir, western larch, Lodgepole pine, western white pine, grand fir, western red cedar, western hemlock and Engelmann spruce. Various species of trees found in the higher elevation areas of these forests are subalpine fir, whitebark pine and subalpine larch.

The three largest private timber landowners, F.H. Stoltze Land and Lumber, Plum Creek and Montana Forest Products together account for approximately 9% (295,500 acres) of the total land area in Flathead County. Land owned by the three largest corporations represents approximately 42.3% of the private land in Flathead County (see Map 2.2).[28]

Many growth issues are associated with forest lands such as the declining timber industry and the conversion of private forest lands into residential development. One important growth-related issue is the wildland-urban interface. The wildland-urban interface (WUI) is commonly described as the zone where structures and other human development meet and intermingle with undeveloped wildland or forests.[29] This WUI zone is comprised of both private and public lands, and poses tremendous risks to life, property, and

[27] Montana Natural Resource Information System
[28] http://www.stoltzelumber.com; http://www.plumcreek.com
[29] Flathead County Community Wildfire Fuels Reduction /Mitigation Plan 2005; Resolution No. 1913

infrastructure in associated communities. These risks to health and safety in the WUI can include inescapable wildfires and natural disasters or human contact with wildlife species such as bears, mountain lions and wolves if development is not adequately mitigated. Forest management practices that reduce these health and safety risks are essential in areas where public or private forested lands border developed properties. Risk reduction strategies can consist of commercial thinning projects and homeowner education.

The State of Montana manages approximately 130,953 acres of forested trust lands in Flathead County. The lands are managed by the Montana Department of Natural Resources Conservation Trust Lands Management Division. Although trust lands are commonly thought of as forestry and/or recreation lands, these lands are managed to generate revenue and uses can be as varied as any other public or private lands in Flathead County.

Agriculture

Agriculture represents a significant part of the historic culture in the Flathead Valley, and as the economy continues to change, agriculture remains critically important to maintaining economic diversity. In 2002, approximately 40% of the private land (234,861 acres) in Flathead County was being farmed; roughly 1,075 individual farms were counted, with the majority of these farms (78%) under 179 acres. By contrast, in 2007 roughly 251,597 acres or 36% of privately held land in Flathead County was used for agricultural purposes.[30] According to the most recent Census of Agriculture conducted in 2007, there were approximately 1,094 individual farms operating in the County, with the majority of these farms (81%) being under 179 acres in size.

Some of the major crops produced by farmers include wheat, barley, flax, alfalfa, grain hays, silage and livestock pasture. Specialty crops such as seed potatoes, mint, lawn sod, canola, mustard, raspberries, strawberries, grapes and vegetable crops are important products.[31]

A primary concern of residents is the conversion of farmland into other land uses, including residential development. The conversion of these lands has a lasting impact on the rural community character, and can negatively affect water quality, water supply and wildlife habitat.

Soils

A comprehensive soils survey for Flathead County has not yet been completed, although portions of the County have been partially mapped by the Natural Resource Conservation Service (NRCS) and the United States Department of Agriculture (USDA), including the Flathead National Forest and the upper Flathead Valley, as well as portions of the Highway 2 West corridor and the Highway 93 corridor south of Kalispell as recently as 2010. Additionally, the United States Department of Agriculture (USDA) completed a soil survey for the Upper Flathead Valley Area in 1960, which continues to be utilized

[30] USDA 2002 and 2007 Census of Agriculture; the next update is scheduled for 2012
[31] Flathead Count y Natural Resource Use Policy

today. However, soils in the relatively flat portion of Flathead County north of Flathead Lake consist of two broad types. One is rocky and poorly drained and is underlain by unsorted glacial till. This is commonly used for timber production. The second type of soil is deep, well structured and well drained. It is underlain by deposits that have been reworked or sorted by running water and is the most productive in Flathead County. It is important to note that soils in this area can be highly irregular as a result of glacial deposits over time; it is not uncommon to find a variety of soil types in one location.

The concept of hydric soils includes soils developed under sufficiently wet conditions to support the growth and regeneration of hydrophytic vegetation. Soils that are sufficiently wet because of artificial measures are included in the concept of hydric soils. Soils in which the hydrology has been artificially modified are hydric if the soil, in an unaltered state, was hydric. Some series designated as hydric have phases that are not hydric depending on water table, flooding and ponding characteristics.[32]

Hydric soil lists have a number of agricultural and nonagricultural applications including land use planning, conservation planning and assessment of potential wildlife habitat. A combination of hydric soil, hydrophytic vegetation and hydrology criteria defines wetlands as described in the National Food Security Act Manual (Soil Conservation Service, 1994) and the Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory, 1987).

Surveys were completed in the upper Flathead valley for most of the valley bottom by the NRCS. The majority of hydric soils are found along the Flathead River in the Lower Valley area, along Ashley Creek and Smith Lake, and southeast of Whitefish. Much of the remaining soil types in the valley bottom have hydric inclusions and characteristics, especially prevalent along the Flathead River corridor. A complete list of hydric soils and soils with hydric inclusions in the Upper Flathead Valley, along with descriptions of soil characteristics, is available on t the Montana Natural Resource Conservation Service (NRCS) website.

Geology and Minerals

The topography of Flathead County was formed during the ice ages when the enormous glacier that filled the Rocky Mountain Trench of British Columbia thinned as it spread southward through the Flathead Valley and into the Mission Valley. The Mission Range split the glacier sending one branch of ice down the Swan Valley and another to the southern end of Flathead Lake. When the glacier melted, it left a deep fill of sediment in the floor of the Flathead Valley.[33]

The valley bottom is generally level to moderately sloping. Most steep slopes occur along the fringe, in the public and private timberlands surrounding the valley bottom, as well as in Glacier National Park. Approximately 75% of Flathead County has slopes

[32] Natural Resource Conservation Service, Hydric Soils circular; http://soils.usda.gov/use/hydric/
[33] Alt, David and David Hyndman: Roadside Geology of Montana. Mountain Press Publishing Company, June 2003, pp. 50.

over 25%, most of which occur in the mountainous areas within the National Forest or National Park.

At the beginning of the 1900's, coal and oil exploration began in the North Fork Valley along the Flathead Fault. Open cut mining is primarily limited to sand, gravel and rock in the Flathead Valley, based upon the geologic composition of the area. Various types of gravel are in demand for road construction, while rock is used for concrete and asphalt road construction, as well as fill and road surfacing project.

The Montana Department of Environmental Quality is the regulatory authority for all open-cut and hard rock mining in the state of Montana. The Opencut Mining Act (82-4-401 et seq., M.C.A.) and resulting regulations apply to the mining of bentonite, clay, scoria, soil materials, peat, sand or gravel.[34] The Hard Rock Mining Program established under the Metal Mine Reclamation Act (MMRA) applies to the mining of all ore, rock, or substances with the exception of oil, gas, uranium, and those materials covered under the Opencut Mining Act. Under the Act, "mining" is defined as the extraction of ores or minerals in commercial quantities for sale, beneficiation, refining, or other processing.[35]

All open cut sand and gravel operations must comply with the applicable zoning regulations if operating in an area that is zoned for such uses. An air quality permit from the DEQ is required for the operation of any mineral crushing or other processing plants.

Currently there are 142 open cut mining operations permitted in the valley; of those currently permitted, 130 are active, 11 are inactive and 1 has been reclaimed. Please reference Chapter 9 – Sand and Gravel Resources, for additional information on mining activity in Flathead County.

PART 4: Air Quality (see Goal 43)

Under the Clean Air Act, the Environmental Protection Agency (EPA) establishes air quality standards to protect public health, including the health of "sensitive" populations such as people with asthma, children, and older adults. EPA also sets limits to protect public welfare. This includes protecting ecosystems, including plants and animals, from harm, as well as protecting against decreased visibility and damage to crops, vegetation and buildings.[36]

Air quality problems in Montana are usually related to urban areas and mountainous topography or river valleys that are sensitive to temperature inversions. Particulate matter and carbon monoxide are the pollutants that have the greatest adverse impact on Montana's air quality. Particulate matter generally comes from vehicles traveling on unpaved roads, sand and gravel from winter traction material, and residential wood burning. Increasing traffic levels on unpaved roads has been a growing problem as

[34] Montana DEQ Opencut Mining Program; http://www.deq.mt.gov/opencut/default.mcpx
[35] Montana DEQ Hard Rock Mining Program; http://www.deq.mt.gov/hardrock/default.mcpx
[36] The Plain English Guide to the Clean Air Act; http://www.epa.gov/air/peg/index.html

development pressure increased over the past decade, and these impacts continue to be a significant topic of discussion when considering appropriate land use in Flathead County. This growth policy contains policies recommending county-wide dust abatement programs to help address this issue.

In January 2008 an Administrative Order on Consent (Docket No. AQ-07-04) went into effect between the Department of Environmental Quality and Flathead County. The basis of the Consent Order centered around Airborne dust created from roads maintained by the County. Excessive dust on County roads was a major contributor to the overall deterioration of air quality in Flathead County, and the County was given the option to pay an administrative penalty or implement a Supplemental Environmental Project (SEP). The County chose to submit an annual SEP report to the DEQ, beginning in 2009, detailing abatement measures related to signage, enforcement and dust palliative application(s) throughout the jurisdiction.[37]

Although prevalent, dust is not the sole contributor to air pollution in Flathead County. Carbon monoxide pollution primarily results from motor vehicle exhaust and residential wood burning. Although industrial sources account for only a small part of carbon monoxide and particulate matter emissions in most communities, industries are the main source of sulfur dioxide and lead pollution in Montana. Forest fires also pose a very serious threat to air quality. The Flathead County Air Pollution Control Program requires the use of all available practicable methods to reduce, prevent and control air pollution from a variety of sources in Flathead County. The Flathead County Air Pollution Control Plan regulates open burning, solid fuel burning, prohibited materials for wood or coal residential stoves, and the Kalispell, Columbia, and Whitefish Air Pollution Control Districts.[38] Air quality monitoring sites are located throughout Flathead County; at the Columbia Falls Ball Park at the corner of 4th Avenue and C Street E.N.; in Whitefish at the end of West 10th and Highway 93 (referred to as the 'dead-end'); and at the Flathead Electric site in Kalispell, at the corner of Center Street and Woodland Avenue.[39]

Congress states that one of the purposes of the Clean Air Act is "to preserve, protect and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores and other areas of special national or regional natural, recreation, scenic or historic value".[40] In Glacier National Park, an extensive air quality monitoring network exists for pollution and visibility conditions. As a Class I airshed, Glacier National Park is provided the greatest air quality protection under the Clean Air Act. This includes visibility and fluoride monitoring and a national atmospheric deposition network. Glacier's monitoring instruments are located mostly on the west side of the

[37] Special Environmental Project Annual Report; Administrative Order on Consent. Docket No. AQ-07-04; Flathead County, MT.
[38] Flathead County Air Pollution Control Program, Chapter II – Declaration of Policy & Purpose
[39] Montana Department of Environmental Quality, Air Quality Monitoring Sites; http://svc.mt.gov/deq/AGMonitoringSites/listDisplay.aspx
[40] Clean Air Act, Title 42, Chapter 85, Subchapter 1, Part C, Subpart (i), Section 7470 – Congressional Declaration of Purpose.

park. Seasonal vegetation collection associated with fluoride monitoring also occurs at various sites on the west side.[41]

[41] Glacier National Park website; http://www.nps.gov/glac/naturescience/airquality.htm